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02-18961 Jan. 23, 1990 L2: 1 of 1

MANUFACTURE OF SEMICONDUCTOR SUBSTRATE

INVENTOR: SEIICHI IWAMATSU
ASSIGNEE: SEIKO EPSON CORP, et al. (30)
APPL NO: 63-169592
DATE FILED: Jul. 7, 1988
PATENT ABSTRACTS OF JAPAN
ABS GRP NO: E0910
ABS VOL NO: Vol. 14, No. 163
ABS PUB DATE: Mar. 29, 1990
INT-CL: H01L 27/12; H01L 21/76

ABSTRACT:

PURPOSE:To prevent separation of an Si film from the bonding face of an SOI substrate, etc., by implanting ions into a bonding interface when bonding silicon with silicon, silicon with silicon oxide, or silicon oxide with silicon oxide by silanol action.

CONSTITUTION:A surface of an Si substrate where an SiO.sub.2 film 2 is formed in the thickness of about 13mm and the surface of other Si substrate where an SiO.sub.2 film 3 is formed in the thickness of about 1.mu.m are brought into contact and are heated to several hundreds degree. That is, by silanol reaction, the SiO.sub.2 film 2 and the SiO.sub.2 film 3 are bonded, and the reverse of the other Si substrate is polished leaving the Si film 4 about 2.mu.m in thickness. At this stage, ions of Si, O, N, H, P, B, As, etc., are implanted 6 to the whole face at about three millions electron volt so that the concentration distribution of ion kind may be maximum just at the interface 5. Hereby, a kind of ion beam mixing action occurs in the interface 5, and then partial separation also ceases to be generated by heating.

⑲日本国特許庁(JP)　⑪特許出願公開

⑫公開特許公報(A)　平2-18961

⑤Int.Cl.⁵	識別記号	庁内整理番号
H 01 L 27/12		7514-5F
21/76	D	7638-5F

⑬公開　平成2年(1990)1月23日

審査請求　未請求　請求項の数 1　(全2頁)

⑤④発明の名称　半導体基板の製造方法

⑳特　願　昭63-169592
㉒出　願　昭63(1988)7月7日

⑦②発明者　岩松　誠一　長野県諏訪市大和3丁目3番5号　セイコーエプソン株式会社内
⑦①出願人　セイコーエプソン株式会社　東京都新宿区西新宿2丁目4番1号
⑦④代理人　弁理士　上柳　雅誉　外1名

明　細　書

1. 発明の名称

半導体基板の製造方法

2. 特許請求の範囲

シリコンとシリコンあるいはシリコンと酸化シリコンあるいは酸化シリコンと酸化シリコンとをシラノール反応により接着するに際し、接着界面にイオン打込みを行なう事を特徴とする半導体基板の製造方法。

3. 発明の詳細な説明

[産業上の利用分野]

本発明はSOI(Silicon on Insulator)基板等の製造方法に関する。

[従来の技術]

従来、シリコンとシリコンあるいはシリコンと酸化シリコンあるいは酸化シリコンと酸化シリコンとをシラノール反応による接着する技術は良く知られた技術であり、該技術を用いてSOI基板等が製作されている。

[発明が解決しようとする課題]

しかし、上記従来技術によると、接着面に於て部分的に剝離が生ずるという課題があった。

本発明は、かかる従来技術の課題を解決し、接着面に於て部分的な剝離が生じないようにする新しいSOI基板等の製造方法を提供する事を目的とする。

[課題を解決するための手段]

本発明は、シリコンとシリコンあるいはシリコンと酸化シリコンあるいは酸化シリコンと酸化シリコンとをシラノール反応により接着するに際し、接着界面にイオン打込みを行なうことを特徴とする。

［実施例］

以下、実施例により本発明を詳述する。

第１図は本発明の一実施例を示すＳＯＩ基板の製造方法における要部の断面図である。すなわち、Ｓｉ基板１の表面にはＳｉＯ₂膜(1) 2を１μｍ厚さ程度形成し、他のＳｉ基板の表面に１μｍ厚さ程度形成したＳｉＯ₂膜(2) 3とを接し、数百度に加熱することにより、シラノール反応によりＳｉＯ₂膜(1) 2とＳｉＯ₂膜(2) 3とを接着し、他のＳｉ基板の裏面から研磨を施して、Ｓｉ膜4を２μｍ厚程度残存させる。この段階では、未だＳｉＯ₂膜(1) 2とＳｉＯ₂膜(2) 3とは仮接着の段階であり、例えば１０００℃程度に加熱すると、界面5では部分的に剥離する。そこで、この段階で予じめＳｉ，Ｏ，Ｎ，Ｈ，Ｐ，Ｂ，Ａｓ等のイオンをイオン打込み6として全面に３００万電子ボルト程度にて、丁度界面5にイオン種の濃度分布が最大になる様に打込むと、該界面5により、一種のイオン・ビーム・ミキシング作用が起こり、その後の加熱により部分的な剥離も発生しなくなる。

［発明の効果］

本発明により、ＳＯＩ基板等の接着面からのＳｉ膜の剥離を防止することができる効果がある。

4.図面の簡単な説明

第１図は本発明の一実施例を示すＳＯＩ基板の製造法における要部の断面図である。

1 …… Ｓｉ基板

2 …… ＳｉＯ₂膜(1)

3 …… ＳｉＯ₂膜(2)

4 …… Ｓｉ膜

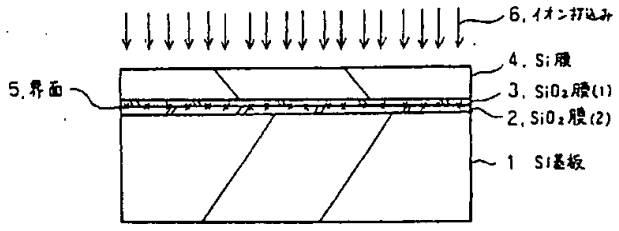
5 …… 界　面

6 …… イオン打込み

以　上

出願人　セイコーエプソン株式会社

代理人　弁理士　上柳雅誉（他１名）



第１図

PTO: 2001-1874

Japanese Published Unexamined (Kokai) Patent Application No. H2-18961, published January 23, 1990; Application No. S63-169592, filed July 7, 1988; Int. Cl.[5]: H01L 27/12 21/76; Inventor: Seiichi Iwamatsu; Assignee: Seiko Epson Corporation; Japanese Title: handoutai kiban no Seizou Houhou (Method for manufacture of a Semiconductor Substrate)

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1. Title of Invention

Method for Manufacture of a Semiconductor Substrate

2. Claim

A method for manufacture of a semiconductor substrate, characterized in that, when the following combinations of silicon are adhered to each other due to a silanol reaction: a silicon-silicon combination; a silicon-silicon oxide combination; a silicon oxide-silicon oxide combination, ions are injected into the adhesive interface.

3. Detailed Description of the Invention

[Field of Industrial Application]

This invention pertains to manufacturing methods for silicon on insulator (SOI) substrates.

[Prior Art]

A technology to adhere the following combinations of silicon due to a silanol reaction are conventionally known: a silicon-silicon combination; a silicon-silicon oxide combination;

a silicon oxide-silicon oxide combination; by using said technology, SOI substrates are manufactured.

[Problem of Prior Art to Be Addressed]

However, according to prior art technology, the adhesive interfaces are partially peeled. This is a disadvantage of prior art technology.

The present invention is produced to eliminate said disadvantage and aims to offer a method for manufacture of a new SOI substrate so as to prevent a partial peeling occurred onto the adhesive interfaces.

[Measures to Solve the Problem]

The present invention is characterized in that, when the following combinations of silicon are adhered to each other due to a silanol reaction: a silicon-silicon combination; a silicon-silicon oxide combination; a silicon oxide-silicon oxide combination, ions are injected into the adhesive interfaces.

[Embodiment]

The present invention is described hereinbelow with reference to the embodiment.

Fig.1 is a cross-sectional view of a main part of a SOI substrate manufactured by using a method as in an embodiment of the present invention. More specifically, a SiO_2 film (1) 2 is formed onto the surface of a Si substrate 1 at about 1 μm and then brought into contact with

a SiO_2 film (2) 3 formed onto the surface of another Si substrate at about 1 μm; by heating to several hundred degrees, SiO_2 films (1) 2 and (2) 3 are adhered with each other due to a silanol reaction; a polishing is applied from the back surface of another Si substrate so as to leave a Si film 4 at about 2 μm. In this stage, SiO_2 films (1) 2 and (2) 3 are still temporarily adhered; for example, the temperature is heated to about 1000°C, an interface 5 is partially peeled. For said reason, when an ion injection 6 is applied onto the entire interface at an about 3,000,000 electronic volt in advance by using the following types of ions: Si; O; N; H; P; B; As, so that the concentration distribution of ion seeds becomes maximum right on interface 5, a type of ion beam mixing effects occurs onto interface 5; because of this, a partial peeling does not occur even when a heating is applied later.

[Advantageous Result of the Invention]

When the present invention is used, a peeling of a Si film from the adhesive surface of a SOI substrate can be prevented.

4. Brief Description of the Invention

Fig.1 is a cross-sectional view of a main part of a SOI substrate manufactured by using a method as in an embodiment of the present invention.

1...Si substrate

2...SiO_2 film (1)

3...SiO_2 film (2)

4...Si film

5...Interface

6...Ion injection

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Chisato Morohashi